Peconic River Remedial Alternatives Workshop

Wetlands Restoration and Applying Phytoremediation

Brookhaven National Laboratory, NY

USDOE TechCon Workshop December 12-13, 2000

URS Corporation

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Overview of Presentation

- **URS Capabilities - Wetlands Restoration and Construction - Ray Hinkle**
- **URS Approach to Wetlands Restoration Through Phytoremediation Application - Michael Coia**

Wetlands Restoration/Construction Relevant Case Histories

- **Christina River Wetlands Remediation, Delaware**
- **Manasquan River Wetland Construction**
- **Delaware Bay Tidal Wetlands Restoration**

Christina River Wetlands Remediation

- **DuPont Newport Facility (Newport, DE)**
- **Former Facility Waste Disposal Areas**
- **Contaminants of Concern:**
- **Excavated Wetland Soil/Sediment**
- **Restored Wetland Hydrology/Vegetation**

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South Wetlands - February 1999

South Wetlands - August 2000

North Wetlands - 1998

North Wetlands - June 2000

Faunal Observations at Newport Wetland Restoration Areas - 2000

INVERTEBRATES	
Amphipods	Leeches
Aquatic Earthworms	Mayflies
Bivalve	Midges
Butterfly species	Springtales
Dragonflies	
FISH	
Alewife	Golden shiner
Banded killifish	minnow
Bay anchivy	Mummichog
Black crappie	Pumkinseed
Bluegill	Spottail shiner
Brown bulhead	White Perch
Common carp	
HERPETILES	
Leopard frog	
BIRDS	
American Crow	Gull Billed Terns
American Kestral	Killdeer
American Robin	Kingbird
Barn Swallow	Kingfisher
Bluejay	Mallard Duck
Canada Goose	Mourning Dove
Cattle Egret	Northern Cardinal
Downey Woodpecker	Osprey
Double-crested Cormorant	Red-tailed Hawk
European Starling	Red-winged Blackbird
Gray Catbird	Spotted Sandpiper
Great Blue Heron	Snowy Egret
Great Egret	Unidentified Owl
MAMMALS	
Fox	Raccoon
Ground Hog	White-tailed Deer

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Manasquan River Wetland Construction

- **Monmouth County, NJ Reservoir Project**
- **Mitigation for Clearing of 360 Acres of Palustrine Forested and Scrub-Shrub Wetlands**
- **Habitat Evaluation Procedures Utilized to Develop Plan**
- **Implemented in Mid-1980s**
- **Approximately 150 Acres of Wetland Creation**
  - **Excavation**
  - **Selective Fill Placement**
  - **Planting**

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Selective Fill Placement at Manasquan Reservoir Wetland Creation Area

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Manasquan Reservoir Created Wetland Immediately Following Construction

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Manasquan Reservoir Created Wetland 6 Months Following Construction

PSE&G Estuary Enhancement Program Wetland Restoration

- **8000 Acres of Tidal Wetland Restoration**
- **New Jersey and Delaware**
- **Restoration of Tidal Flows to Impounded Salt Hay Areas**
  - **Dennis Township - 360 Acres**
  - **Maurice River Township - 1,100 Acres**
  - **Commercial Township - 3,000 Acres**

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Dennis Township Design Considerations

- **Evaluated Geomorphology of Nearby Natural Channel Systems to Develop Concepts for New Channel Layouts**
- **Performed RMA II Hydraulic Modeling of Inundation and Drainage Using Varying Channel Configurations**
- **Sized Channels to Have Subtidal Habitat at Low Tide and Convey Tidal Flows at < 2 feet/second**
- **Located High Marsh Creation Areas for Placement of Materials Dredged from Channels**
- **Relied on Natural Seed Sources for Reestablishment of Spartina alterniflora**

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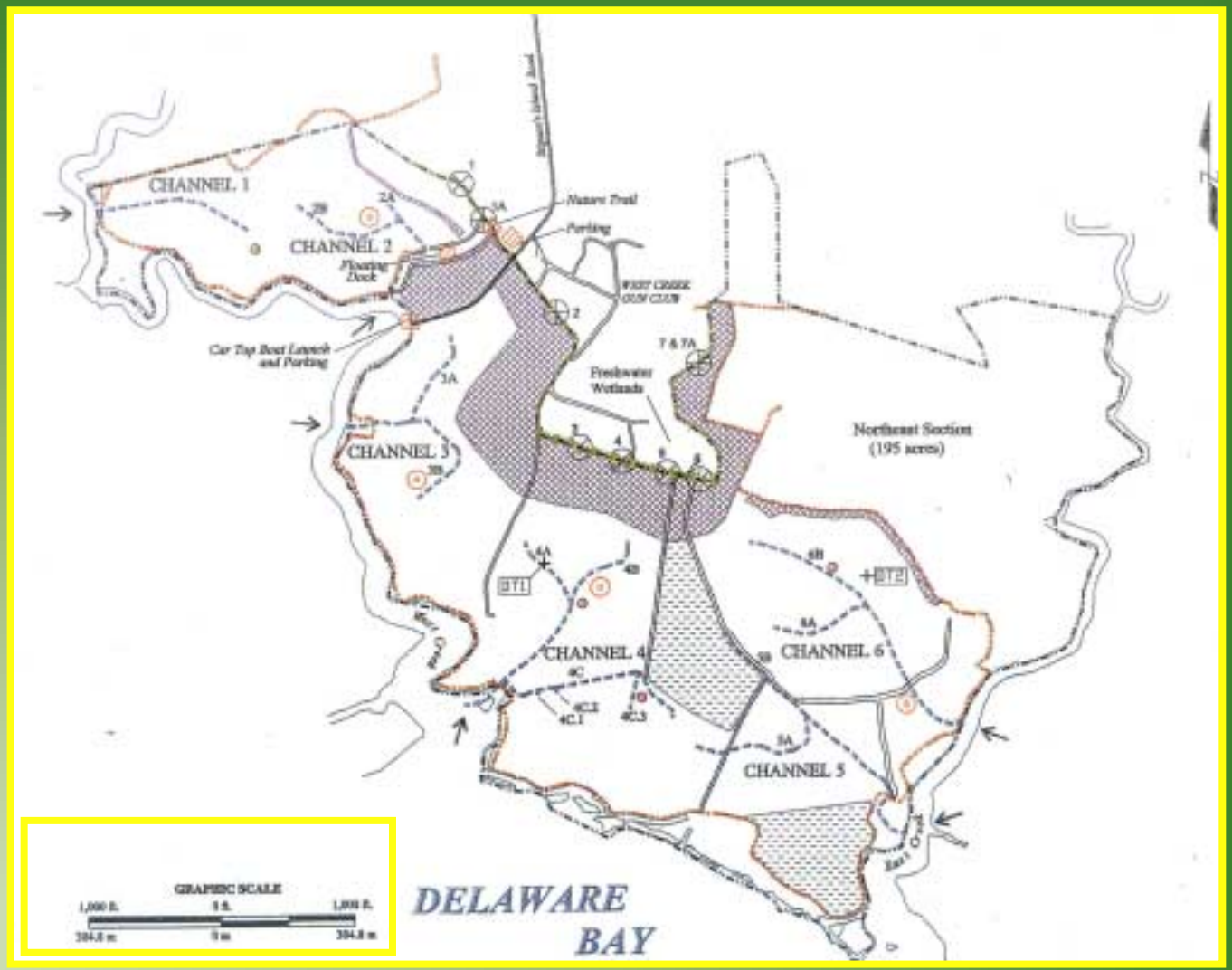
Dennis Township Site Wetland Restoration Design



Channel Excavation at Dennis Township Site - 1996

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Channel Slope Grading at Dennis Township Site -1996

Dennis Township Site Following Construction

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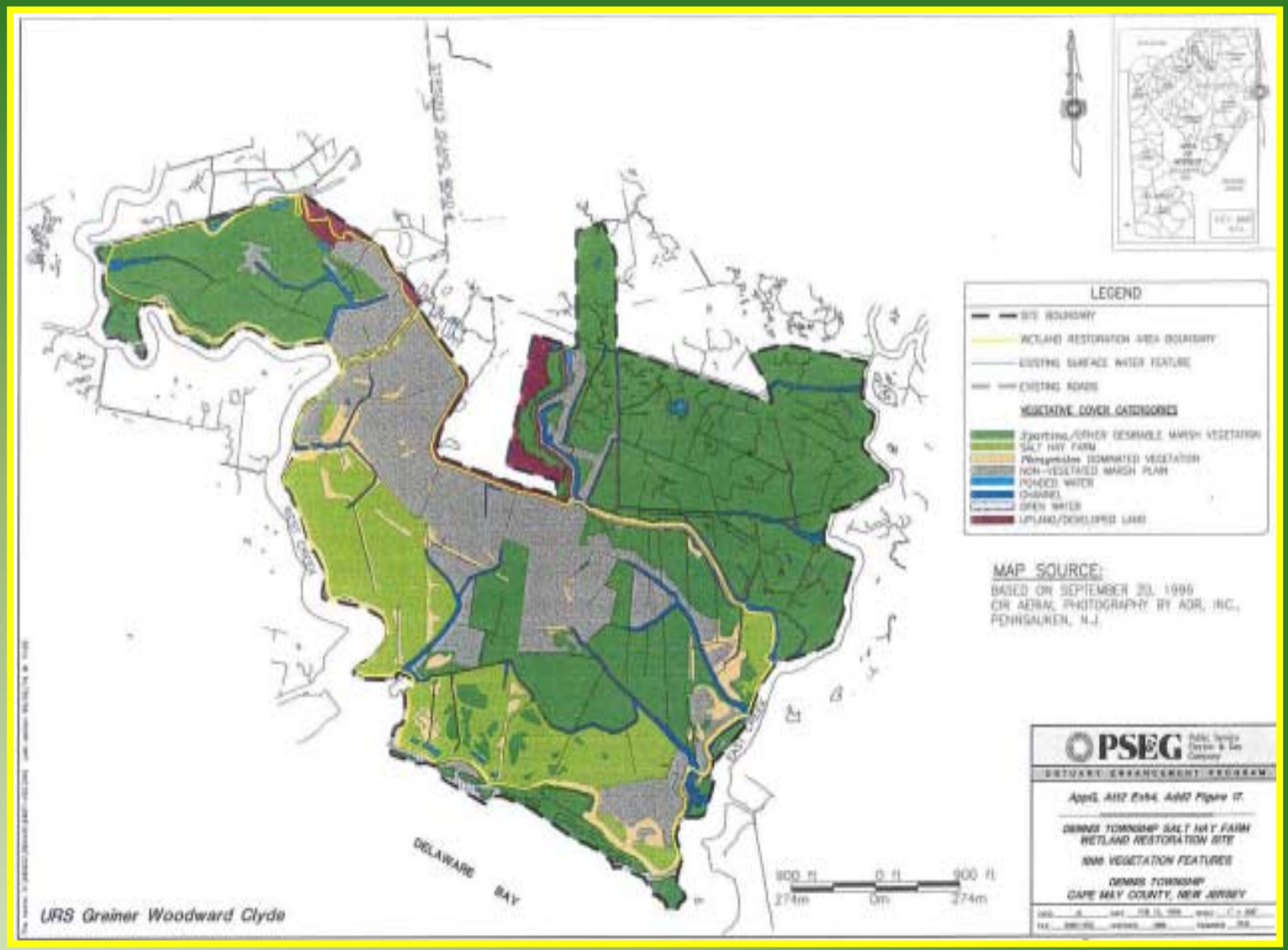
1996 Vegetation Cover at Dennis Township Site



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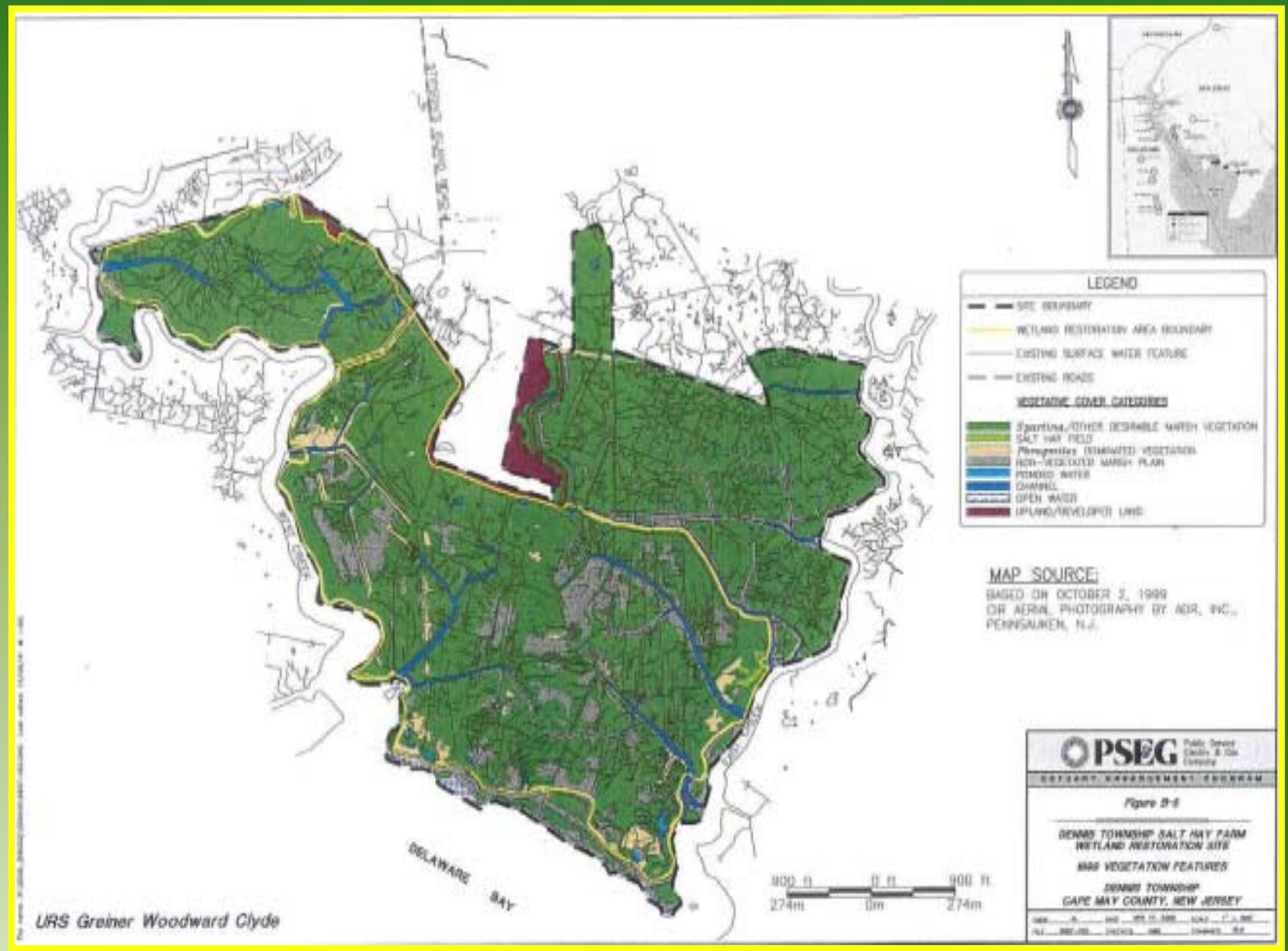
1999 Vegetation Cover at Dennis Township Site



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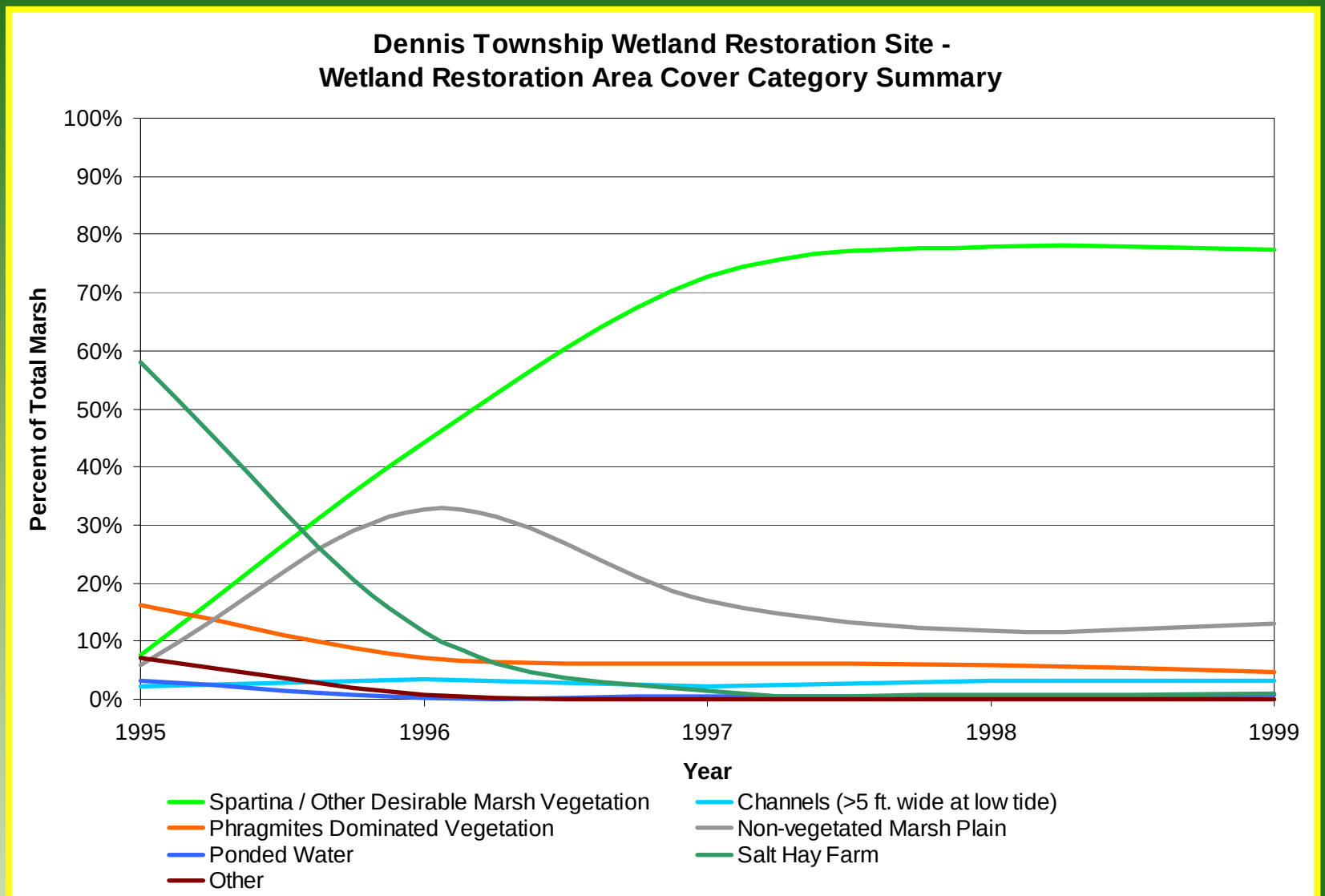
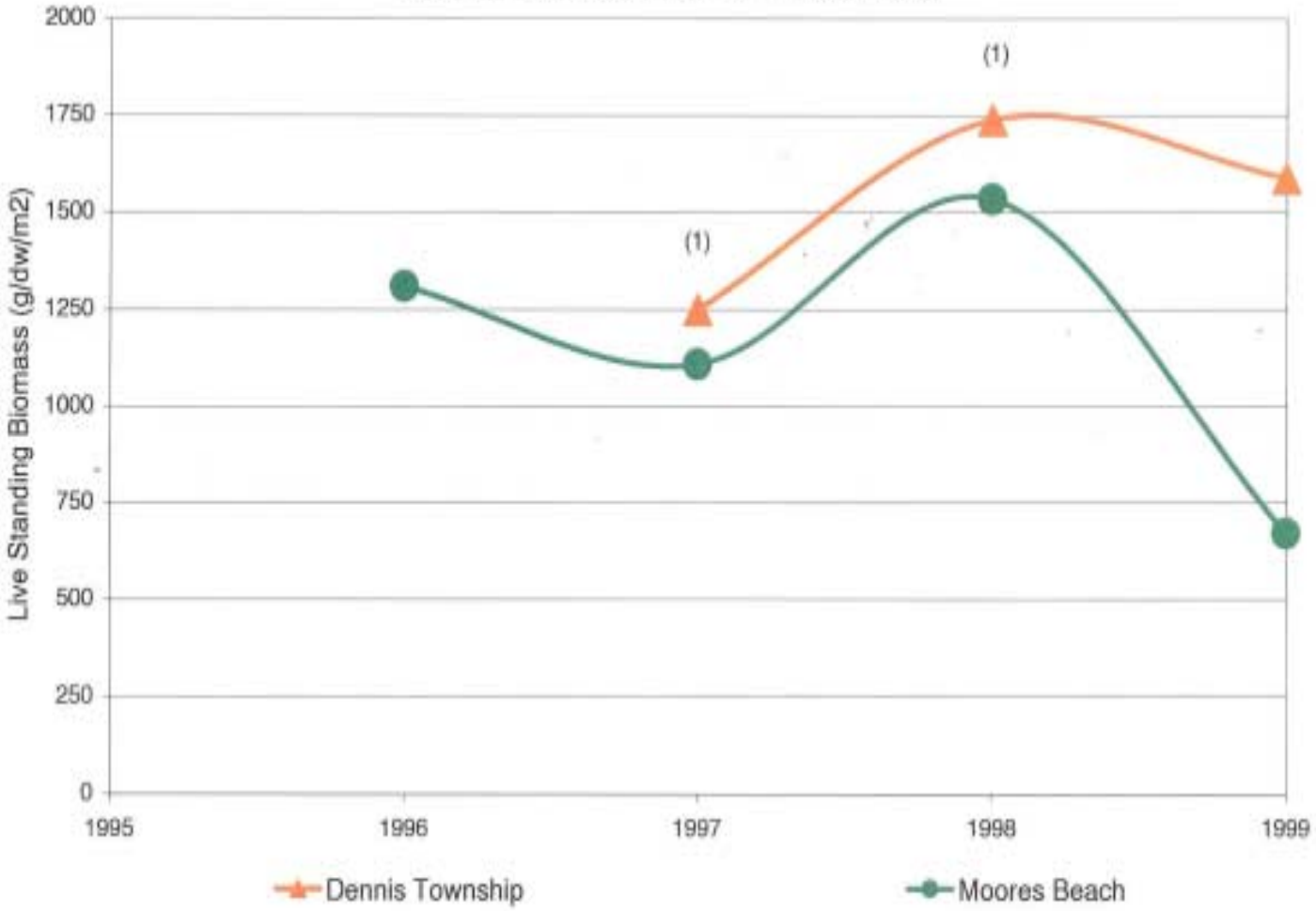

Dennis Township Wetland Restoration Site -
Wetland Restoration Area Cover Category Summary
Percent of Total Marsh
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1995
1996
1997
1998
1999
Year
Spartina / Other Desirable Marsh Vegetation
Phragmites Dominated Vegetation
Ponded Water
Other
Channels (>5 ft. wide at low tide)
Non-vegetated Marsh Plain
Salt Hay Farm

Live Standing Biomass Annual Comparisons
Salt Hay Farm Wetland Restoration Sites and Moores Beach Reference Marsh
Spartina Dominated Quadrats - Transect Data



(1) Statistical analysis was conducted on 1997 and 1998 data. Reference Marsh and Restoration Site data were not significantly different.

Dennis Twp - Post Restoration Conditions

Wetlands Restoration and Phytoremediation

- **Contaminated Sediments - Conventional "Wisdom"**
  - **Removal/Dewater/Transport/Disposal**
  - **Wetlands Restoration & Replanting**
- **Linkage Phytoremediation & Wetlands Restoration**
  - **Engineered Treatment Wetlands - Designated Areas**
  - **Non-Impacted Areas - Ecosystem Restoration for Habitat**
  - **Phytoremediation Operations & Maintenance**

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Peconic River Restoration Challenges

- **Contaminated Sediments**
  - **Mixed Rad/Chem Waste and Mixed Metals/Organics**
  - **Cesium-137, Mercury, Copper, Silver, PCBs, DDD**
  - **Primarily Low-Levels and Isolated Low-Flow Deposition Areas**
- **Desire For Ecosystem Restoration**
  - **Ecosystem Restoration for Habitat**
  - **Contaminated Sediment Areas Versus Non-Impacted Areas**
- **WWTP Filter Beds - Ongoing Source Areas**
  - **Recent Investigations - Continuous Cs137 & Hg Loadings**

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Previous FFS Phytoremediation Assessment

- **Status of "In-Situ" Phytoremediation**
  - **No Fully-Implemented Wetlands Phytoremediation Program**
  - **No Ongoing Demonstrations w/Mixture Rad/Metals/Organics**
  - **Multiple Sites w/Success - Individual Contaminants & Lab/Field**
  - **Tremendous Regulatory Mandate for "Technology Inclusion"**
  - **Multiple USDOE/USDOD/USEPA/States ITRC Programs**
- **Requirement for "Site-Specific Demonstration"**
  - **1999-2000 Demo During Remedial Design Investigations**
  - **Further CRADA Lab Testing w/Transgenics (BNL &APGEN)**
  - **Expand to "Field Demonstration" - Target Wetlands & Terrestrial**
  - **Develop Peconic "Data Base" for Technology Implementability**
  - **1999 FFS Cost Estimate @ $2M (Assumed No Biomass Harvest)**

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Previously Proposed BNL Phyto Program 1999 Recommendations to BNL

- **Remedial Design Investigations - Prior to ROD**
  - **Designated "Wetland Treatment Areas" Along Peconic Flow Path**
  - **Isolate "Interim Remediation Areas" - Conduct Phyto Field Demo**
  - **Link Ongoing BNL CRADA with Phyto Demo Testing**
  - **Complete 18-Month Assessment & Finalize Restoration Design**
- **Implement Linked Phyto & Peconic Restoration Program**
  - **Construct Engineered Treatment Wetlands**
  - **Non-Impacted Areas - Completion of Wetlands Restoration**
  - **Ongoing Phytoremediation Area O&M**

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URS Phytoremediation Capabilities

- **URS Provides Turnkey Phyto Implementation Projects**
  - **Phyto Assessments & Treatability Studies - Linkage with APGEN**
  - **Engineering & Design - Expanded by Wetlands Restoration, Eco RA, Modeling, Botanists - Complete In-House Team**
  - **Recommend & Implement Varied Ecosystems**
  - **Self-Perform & Subcontract Distinct Phyto Construction Tasks**
- **Recent URS Phytoremediation Projects**
  - **Constructed Wetlands & Restoration - Athens, GA - Chlor VOCs**
  - **Hydraulic GW Containment - NC PRP Group - DDT**
  - **Phyto Vegetative Capping - Chevron, CA - 85 Acres PAHs Soils**

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